

**PRE-APPEAL BRIEF REQUEST FOR REVIEW**

Docket Number (Optional)

42390P8746

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Signature

Typed or printed
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Application No.

09/591,867

Filed

June 12, 2000

First Named Inventor

Tinku Acharya

Art Unit

2615

Examiner

Nhan T. Tran

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a Notice of Appeal.

The review is requested for the reason(s) stated on the attached sheet(s).

NOTE: No more than five (5) pages may be provided.

I am the:

- ☐ applicant/inventor.
- ☐ assignee of record of the entire interest.
See 37 CFR 3.71. Statement under of 37 CFR 3.73(b) is enclosed.
(Form PTO/SB/96)
- ☒ Attorney or agent of record.
Registration Number 54,962
- ☐ attorney or agent acting under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

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December 07, 2005

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NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required.

☐ *Total of _____ forms are submitted.

Pre-Appeal Brief Request for Review

Application No. 09/591,867
Attorney Docket: 42390.P8746

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Acharya et al.

Serial No.: 09/591,867

Filed: June 12, 2000

For: Method of Using Hue to Interpolate Color Pixel
Signals



Examiner: Tran, Nhan T.

Group Art Unit: 2615

Confirmation No.: 4736

Pre-Appeal Brief Request for Review

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Final Office Action of September 16, 2005, please consider the following pre-appeal brief request for review for the above-identified application.

All independent claims 1, 13, 16 and 19 currently pending are rejected under 35 U.S.C. §103(a) over Bishay et al (US 6,507,364; hereinafter “Bishay”) in view of Bulman (US 6,351,265). During prosecution, Applicant has consistently argued that Bishay does not teach or suggest the invention as claimed and, hence, that the Examiner has failed to establish a *prima facie* §103(a) rejection.

Claim 1 recites a method of using hue to interpolate color pixel signal values including the limitations of

for a particular pixel location in a subsampled image,

comparing relative changes in hue for two mutually orthogonal directions across said particular pixel location; and

computing a color signal value for that particular pixel location for a color plane other than the color plane of the pixel signal value in the subsampled color image at that location, the computation **including relatively weighing the relative changes in hue, the relative weights depending, at least in part, on the difference in hue value in one particular direction relative to the other.**

(Claim 1; lines 2-8; emphasis added). The other independent claims recite similar limitations.

Applicants continue to argue that, at a minimum, Bishay fails to teach or suggest “computing a color signal value ... including relatively weighing the relative changes in hue, the relative weights depending, at least in part, on the difference in hue value in one particular direction relative to the other” as needed to support a *prima facie* rejection under §103(a).

To clarify matters, Applicant wishes to draw attention to Applicant’s detailed description where the first recited claim limitation of “comparing relative changes in hue for two mutually orthogonal directions” may include, for example, referring to the implementation of Figure 2 directed to interpolating a green pixel value from a sub-sampled bayer pattern array, comparing

change in hue for the horizontal direction and the vertical directions with respect to [a] particular pixel location...using the following equations.

$$RCH_hor = | \frac{1}{2} \times [-R_{m,n-2} + 2G_{m,n-1} - 2G_{m,n+1} + R_{m,n+2}] |$$

$$RCH_ver = | \frac{1}{2} \times [-R_{m-2,n} + 2G_{m-1,n} - 2G_{m+1,n} + R_{m+2,n}] |$$

(Application; page 5, line 22 to page 6, line 5).

The second recited claim limitation of “computing a color signal value...including relatively weighing the relative changes in hue, the relative weights depending, at least in part, on the difference in hue value in one particular direction relative to the other” may thus, for example, include

If the relative change in hue in the vertical direction [RCH_ver] is greater than the relative change in hue in the horizontal direction [RCH_hor], then the values in the horizontal direction, that is, in this embodiment, the green and red pixel signal values that are the immediately adjacent pixel signal in the horizontal direction, **are weighed more heavily**. (Application; page 6, lines 10-13; emphasis added).

In other words, where implementation of the first limitation resulted in establishing that vertical direction had greater change in hue than the horizontal direction, the computation (i.e., the interpolation computation) of the green color signal value may include multiplying (i.e., “weighing”) by a larger factor that quantity representing neighboring horizontal signal values of the particular pixel location (“Ihor”) than that quantity representing neighboring vertical signal values of the particular pixel location (“Iver”):

(T)he missing green pixel signal values in this particular pixel location is estimated, in this embodiment, as

$$\begin{aligned} G_{m,n} &= [0.5 \times (Ihor) + 0.1 \times (Iver)] / (0.5 + 0.1); \text{ or} \\ G_{m,n} &= 2 \times [0.41667 \times (Ihor) + 0.08333 \times (Iver)] \text{ where} \\ Ihor &= (G_{m-1,n} + G_{m+1,n})/2 + 0.5 \times (-R_{m-2,n} + 2R_{m,n} - R_{m+2,n})/4 \\ Iver &= (R_{m,n-1} + R_{m,n+1})/2 + 0.5 \times (-R_{m,n-2} + 2R_{m,n} - R_{m,n+2})/4 \end{aligned}$$

(Application; page 6, line 19 to page 7, line 4). Where the factors 0.5 and 0.1 are merely example weight factors. Similarly, as the Application discusses, if the implementation of the first limitation resulted in establishing that horizontal direction rather than the vertical direction had greater change in hue than the green pixel value is estimated using $G_{m,n} = [0.5 \times (Iver) + 0.1 \times (Ihor)] / (0.5 + 0.1)$. (Application; page 7). Again, the weight factors used in this example implementation are merely representative and the invention is not limited to specific weight factors. Importantly, the claimed act of computing (i.e., interpolation) employs two directions where one of those directions is according more weight because it has relatively less variation in hue than the other direction. In other words, in accordance with the claimed invention, changes in hue are compared for two directions and the

subsequent interpolation employs both of those directions, one weighted heavier than the other in the interpolation.

The Examiner has maintained that Bishay teaches the claimed invention except that Bishay discloses comparing relative changes in intensity rather than relative changes in hue and that Bulman corrects this deficiency in Bishay by teaching the use of hue. (Final Office Action; page 4). In particular, the Examiner cites Figs. 2-7; col. 2, lines 45-56; col. 4, lines 40-54; and col. 5, line 9 to col. 6, line 4 of Bishay as disclosing the claimed invention. (Final Office Action; page 4). However, a careful reading of Bishay directly refutes the Examiner's position. Bishay discloses, particularly with respect to Bishay's Figs. 2 and 7, that edge detection kernels, disposed at different orientations (i.e., horizontal/vertical, or 45° diagonal/-45° diagonal, etc.) to a pixel location to be interpolated are used to detect changes in neighboring pixel intensities indicative of a nearby edge. (Bishay; col. 5, lines 46-60). That direction yielding the maximum change in intensity is then selected as representing the edge direction relative to the pixel location. (Bishay; col. 5, lines 61-64). Bishay then teaches determining upon which side of the edge the pixel location lies. (Bishay; col. 5, lines 61-64). Only then does Bishay disclose that

The missing color components of the current pixel X 20, red and blue, are then reconstructed by retrieving in step 40 one red and one blue neighboring pixel **from the same side of the edge** the current pixel X 20 belongs to.

(Bishay; col. 6, lines 30-34; emphasis added). In other words, to summarize, Bishay discloses detecting edges relative to a "current" pixel, determining which side of any such edge the pixel lies, and then interpolating color values for that pixel using color values is undertaken along only one direction and that direction is not necessarily one of the directions across which Bishay's edge detection occurs. As Bishay discloses

For example, if it is determined that the current pixel X 20 is closer to the top side (of an edge), because its intensity value is closer to the top average value of A 22 and B 24 kernel pixels, then a red pixel and a blue pixel from the line above the current pixel X 20, which are neighboring the current pixel X 20, are used in step 40 as the red and blue neighbors. The $Green_{ave}$ is then determined as the average intensity of the three pixels from the determined side, the current pixel X 20, and its A 22 and B 24 kernel pixels.

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(Bishay; col. 6, lines 46-54).

Thus, Applicants assert that Bishay does not disclose that the interpolation computation itself involves relatively weighing changes in intensity in one particular direction relative to another as the Examiner maintains and as would be required to support the Examiner's rejection. Hence, the Examiner's *prima facie* case fails in at least this respect.

The Examiner has relied upon Bulman solely to correct the failure of Bishay to disclose using relative changes in hue as opposed to intensity. (Final Office Action; page 4). Applicants assert that Bulman fails to correct the deficiencies of Bishay as laid out above.

In conclusion, Applicants maintain that the Examiner has failed to maintain a *prima facie* rejection under §103(a) and thus allowance of all the claims is respectfully requested.

Respectfully submitted,



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